Chemical & Engineering NEWS

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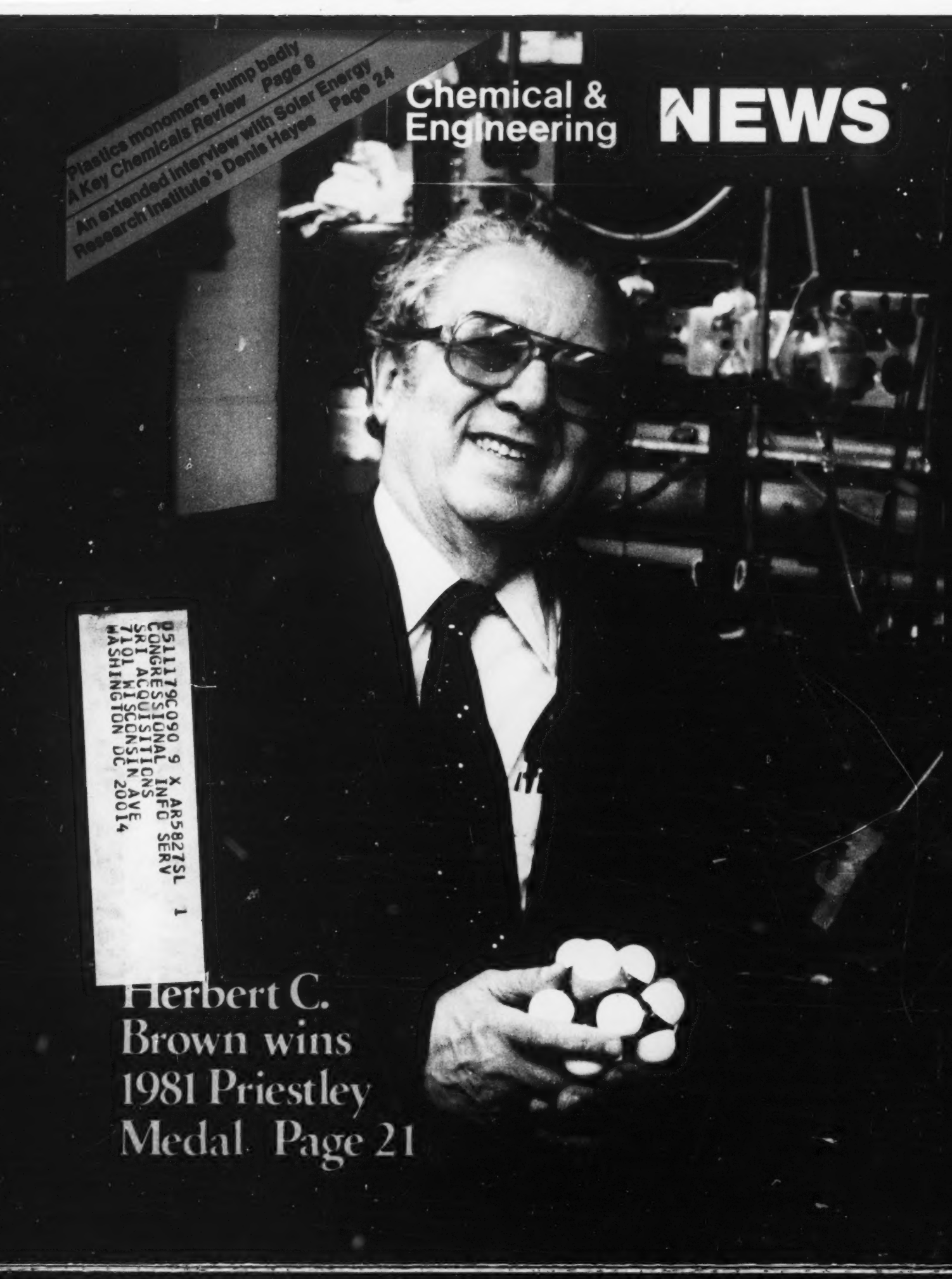

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- ***Newspaper article*** *on as-yet-unpublished report of NCI studies on carcinogenicity of TCDD draws concern of Dow Chemical and study's sponsors.* ***Page 5***
- ***Federal panel*** *on toxic substances strategy calls for improved regulatory, research programs on hazardous chemicals.* ***Page 5***
- ***C. P. Snow,*** *distinguished British scientist, writer, and lecturer, has died in London at the age of 74.* ***Page 6***
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Business

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Priestley Medal

- ***Priestley Medalist Herbert C. Brown*** *reflects on work on hydroboration, state of chemical education today, lack of innovation in large companies.* ***Page 21***

Technology

- ***Denis Hayes,*** *director of the Solar Energy Research Institute, sees the task as developing a fuel that is economically competitive and environmentally attractive.* ***Page 24***
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Education

- ***Students with nonscience degrees*** *perform just as well in medical school as those holding natural science degrees, SUNY medical school study shows.* ***Page 33***

Market sags for plastics monomers

Trouble in plastics market has worked its way back to major monomers—vinyl chloride, styrene, propylene oxide—which are reeling

Is 1980 going to be a repeat of the 1975 debacle for vinyl chloride, styrene, propylene oxide, and other U.S. plastics monomers?

At this point in the current recession, industry sources report monomer sales declines that suggest ominously that another crunch could well be in the making for this multibillion-dollar part of the U.S. chemical industry. Combined production value for vinyl chloride, styrene, and propylene oxide—whose outlooks are detailed on the following pages—will be about $4.4 billion in 1980.

So far, the situation has an important time difference from what happened in 1975. Last time, the slump in production began in late 1974 and took its full toll during 1975. In 1980, however, production of these chemicals held up during the first quarter.

However, after some faint warning signs, sales fell off drastically beginning in mid-April and continued down during May and June. The rate of decline appears to have abated in June, possibly because of significant price cuts through temporary voluntary allowances and discounts. For example, about the worst case has been temporary voluntary allowances up to 6 cents a lb from 40 cents for styrene plus other less formal discounts of another 5 cents or more.

This supposed help from price cutting may not last. Lower prices, of course, help shift inventories downstream as consumers gamble that such cuts will not be repeated and as they try to "average down" costs. But if the inventory pipeline backs up after a few months because end market sales continue to fall, price cutting will do little to raise overall monomer production.

In fact, on the Gulf Coast, there are no takers at all for some spot-market monomer even at ridiculously low prices. This lack of volume makes it hard to judge the accuracy of spot price rumors.

If sales continue to fall, production will follow and continue low in 1981. In this event, recovery next year may not match 1976, when many major-volume organic chemicals staged dramatic comebacks.

For example, production of vinyl chloride, styrene, and propylene oxide dropped in 1975—25%, 22%, and 13%, respectively, from 1974. However, by 1976, production of each exceeded production in 1974—vinyl chloride 1%, styrene 6%, and propylene oxide 3%.

Now the important questions are whether monomer production will slump as badly this year as in 1975 and recover in 1981 as fast as in 1976. Proposed answers are diverse. Based on early reports of production, 1980 declines may not be so large as those of 1975. However, as consumer goods plant shutdowns are extended and as maintenance and demand-related shutdowns for chemical plants drag on, forecasts for 1980 chemical production are being cut back.

The question of recovery also brings diverse answers. As the recession deepens, the view of a V-shaped recession with a fairly short duration for the slide and rebound gains adherents. But many business people in chemicals don't expect a bottom until early 1981 with a slow recovery lasting throughout the year.

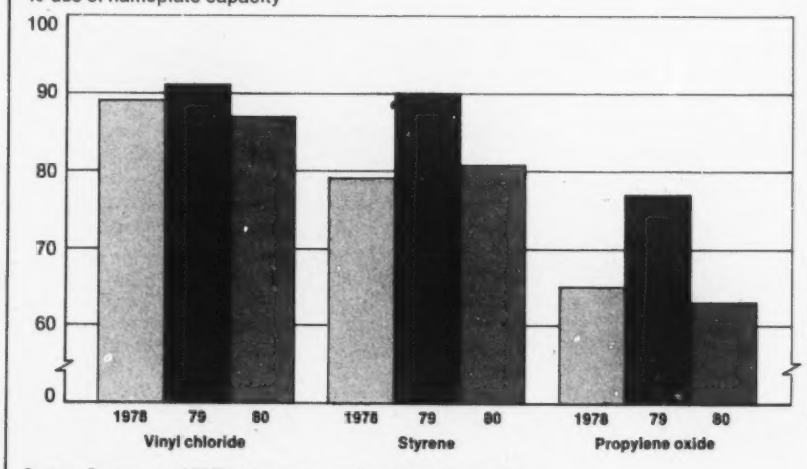
Even with a good recovery next year,some plastics monomers will face overcapacity problems. Capacity expansions are coming for all three monomers covered here in 1980, the most by far for vinyl chloride. If recovery is slower than anticipated and capacity expansions are started up about as scheduled, producers of all three monomers may suffer back-to-back years of low capacity use in 1980 and 1981.

Of the three, vinyl chloride could have the biggest problem. Assuming plans hold up, by 1981 some 2 billion lb per year of new nameplate capacity is expected to be coming on stream to bring vinyl chloride capacity to about 10 billion lb. Strong recovery plus renewed demand growth will be needed to keep operating levels profitable in 1981 and 1982.

Styrene and propylene oxide are in better shape from a new-capacity standpoint. One major unit will be added to the styrene total, and a large debottlenecking will come through this year for propylene oxide. Styrene capacity use could bounce up nicely in 1981, but propylene oxide still will take several years to work off the overcapacity which has plagued it in recent years.

Bruce Greek, Houston

Plant use is well down in 1980 for plastics monomers



Sources: Producers and C&EN estimates, International Trade Commission

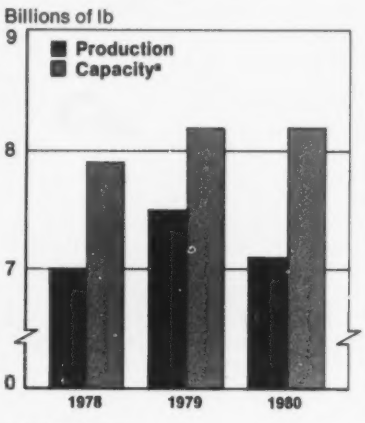
Key Chemicals

$CH_2{=}CHCl$

Vinyl chloride

- ***Production slipping***
- ***Capacity bulge due***
- ***Prices softening***

PRODUCTION/CAPACITY



a As of first quarter.

HOW MADE

Dehydrochlorination of ethylene dichloride made from ethylene and chlorine

MAJOR DERIVATIVES

Vinyl polymers nearly 100%

MAJOR END USES

Fabricated vinyl plastic items nearly 100%

FOREIGN TRADE

Exports—declining in 1980 about 15% to under 1 billion lb, imports—negligible

PRICES

Contract 22 cents a lb; discounting growing

COMMERCIAL VALUE

$1.5 billion for total production, 1980

A sales decline in polyvinyl chloride (PVC) is worrying U.S. producers of the monomer, vinyl chloride. All hopes of exceeding 1979 monomer production of 7.5 billion lb appear gone, even after a first-quarter 1980 production rate of more than 7.7 billion lb on an annualized basis.

Quite a range of estimates exists for 1980 vinyl chloride production as producers try to evaluate the impact of the recession on their operations. The estimate spread, however, is relatively less than for many other organic chemicals. Vinyl chloride output estimates range from 6.5 billion to 7.5 billion lb. The high end of estimates, matching 1979 production, comes from optimists who expect pipe and other PVC extrusions to provide some luster for 1980. A consensus would put vinyl chloride production down about 5% from 1979 at about 7.1 billion lb.

If production holds up this well, producers will have to run their plants at 86% of first-quarter nameplate capacity of 8.2 billion lb. Considering the technical constraints on vinyl chloride production, such as emissions control, this operating level indeed would be good. It would just about equal traditional rates and trail more recent rates not too badly.

The operating rate for vinyl chloride plants was much higher early in the year. In fact, the first-quarter production rate of more than 7.7 billion lb per year probably could not be sustained for a year, since it suggests that plants run at 95% of capacity, extremely high for vinyl chloride.

A lot of new vinyl chloride capacity is due later in 1980, about 2 billion lb total at Georgia-Pacific, PPG Industries, and Dow Chemical. But it will not be available for much operation this year because it is scheduled on stream so late in the year. Since current demand for PVC is slowing, the owners of the new production capacity aren't likely to push their construction contractors very hard to complete the plants ahead of schedule.

These new units, of course, concern the industry, as they guarantee overcapacity in 1981 even if vinyl chloride recovers and then returns to historical growth rates. This worry naturally leads to efforts to firm up customers for both existing and new capacity and puts downward pressure on prices, particularly of PVC.

Efforts to raise PVC prices in the face of rising costs weren't successful in the second quarter. In fact, discounting has increased with falling sales. Vinyl chloride also has been hit with some discounting.

About the best that can be said for this bad situation is that price pressure has had the same effect on the raw materials for vinyl chloride—ethylene and chlorine. The reasons for this are the same as for the monomer—new capacity coupled with slowing demand. Ethylene prices, for example, are down nearly 10% for July 1 contract material from the initially announced April 1 contract prices.

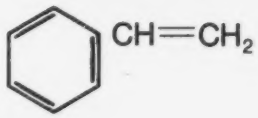
These lower prices will not spur consumption of PVC except in a few special cases. All that lower prices will do is let someone further down the use chain improve profits, one chemical source says discouragingly.

PVC use is growing mainly in various extrusions, now about 60% of the total. Pipe dominates extrusions and probably accounts for more than 40% of PVC use in the U.S. Pipe could be the savior for vinyl chloride production during the recession, say the optimists. Commercial construction, the important type for PVC, apparently is holding up better than are most other kinds of construction. In turn, demand is holding up for PVC pipe, floor coverings, and other fabricated shapes. Strong demand for PVC pipe in agriculture and the like even could result in a net gain for the pipe and fittings outlet in 1980.

However, other uses of PVC will not help PVC and vinyl chloride demand in this recession year. Some uses, such as molded products, may decline. One example is recording disks, whose PVC consumption has gyrated in recent years.

As is the case with many monomers, the dominant use of the polymer will determine the fortunes for the year. For vinyl chloride, that means PVC pipe. Pipe didn't help vinyl chloride in the previous recession in 1975, but some industry sources hope it will this time and give vinyl chloride another above-average year among organic chemicals.

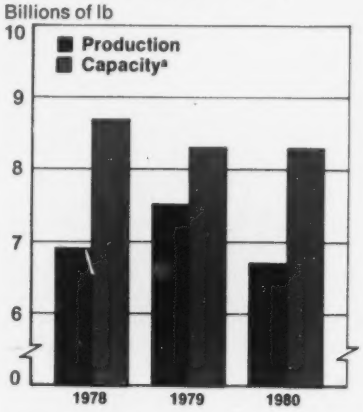
Key Chemicals



Styrene

- ***Demand slumping***
- ***New capacity due***
- ***Prices plummeting***

PRODUCTION/CAPACITY



a As of first quarter.

HOW MADE

Dehydrogenation of ethylbenzene either made from ethylene and benzene or recovered from refinery reformate; coproduction with propylene oxide

MAJOR DERIVATIVES

Polymers 80%, styrene-butadiene rubber 10%

MAJOR END USES

Fabricated plastics 90%

FOREIGN TRADE

Exports—falling to around 750 million lb in 1980, imports—negligible

PRICES

About 35 cents a lb contract at plants

COMMERCIAL VALUE

$2.25 billion for total production, 1980

Some U.S. producers of styrene expect a worse year than hinted by production statistics so far and possibly even worse than suggested by the recession now in full swing. Current business gloom leads to some forecasts of a 20% decline in 1980 styrene production. That means a drop of 1.5 billion lb to about 6 billion lb after 1979's 7.5 billion lb.

Fortunately, other sources see a much smaller decline in 1980 production. More optimistic industry voices put 1980 output at about 7 billion lb, off a half-billion lb, or 7%.

A consensus seems to be about a 10% production decline for styrene to 6.7 billion lb, about the level of 1977. If production does come in at 6.7 billion lb in 1980, the industry's plant operating rate will average a fairly acceptable 81% for the year, excluding new capacity coming on stream now.

A net addition of 600 million lb per year of capacity is coming from American Hoechst. The company has a new plant at Bayport, Tex., with 800 million lb of capacity, and it is shutting down about 200 million lb of capacity at Baton Rouge. However, since startup of the new plant began during the second quarter, the addition will have a potential 1980 output of no more than 400 million lb. Counting partial capacity of the new plant, the industrywide operating rate then would be a bit less than 80% on average for the year. Styrene's first-quarter nameplate capacity was 8.3 billion lb.

Pretty good cases can be made for both higher and lower production of styrene in 1980 than the consensus 6.7 billion lb. These arguments hinge on the effects of high production early in 1980, inventory changes, slumping current sales, loss of markets to olefinics, and the pace of eventual recovery from the recession.

The optimists' case rests mainly on two factors—good production early in 1980 and continued inventory building. During the first quarter, production of styrene topped 2 billion lb, or more than 8 billion lb at an annual rate, according to preliminary estimates of the International Trade Commission. Production then fell 86 million lb in April from March, or roughly 12%. If production for the rest of the year averages a bit less, say off 15%, the total for the remaining quarters of 1980 will be about 5 billion lb. Adding the 2 billion lb from the first quarter brings the total to 7 billion lb for the year.

The pessimists' view is more complicated. It holds that strong production in first-quarter 1980 reflected inventory building at a high rate and not strictly consumption. Far from helping the situation, these inventories will be a burden on production for the rest of the year, driving production rates down to low levels. Much of the inventory building came not from anticipation of styrene demand, but from the desire for a value-added place to put raw material benzene, whose own demand and value in most uses are falling badly.

Sagging styrene outlets are important to the pessimists' view. Exports are down and may continue down, possibly 20% below 1979. In addition, competition from olefinic polymers is slowing growth of polystyrene in major use categories such as packaging and consumer goods. And certainly, the slump in tire production will further reduce styrene use in styrene-butadiene rubber during the year.

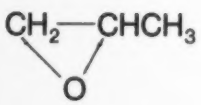
Even the optimists admit that slowing demand for styrene is putting fierce pressure on prices. Big allowances off contract prices are being made, and discounting has increased rapidly in recent weeks, particularly in product for export. From a 40 cent-per-lb list-price peak, styrene's price has hit 31 cents and even lower in spot sales.

The price pressure on styrene also reflects pressure on benzene prices, which are coming way down, more than 15%, in both contract and spot sales. Since benzene represents 85% of the materials cost for styrene, its price greatly influences styrene's price. In turn, benzene's price is directed by crude oil prices and tempered by gasoline demand.

A year ago benzene was putting strong upward pressure on the styrene price. However, this year the benzene price has tumbled from $1.80 per gal to $1.50 on some spot market quotes, and is probably headed still lower.

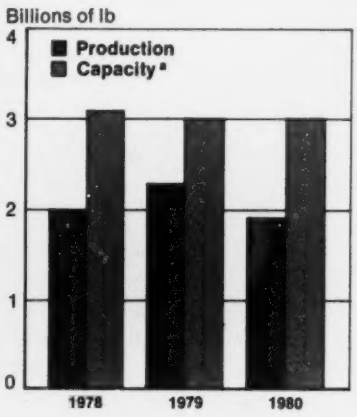
Price pressure and slumping demand certainly will do no good for styrene in 1980. Its short time in the profits sun in 1979 is over, and producers hope the financial night in 1980 will be short.

Key Chemicals



Propylene oxide

- ***Demand well down***
- ***Capacity to drop***
- ***Poor year expected***



a As of first quarter.

HOW MADE

Chlorohydration of propylene and subsequent saponification with lime, peroxidation of propylene

MAJOR DERIVATIVES

Polyols 60%, propylene glycol 25%

MAJOR END USES

Polyurethanes 60%, unsaturated thermoset polyesters 10%

FOREIGN TRADE

Exports—falling to about 160 million lb, imports—holding at about 40 million lb

PRICES

Contract at plant 35 cents a lb; no spot market

COMMERCIAL VALUE

$650 million for total production, 1980

1980 will bring more changes for propylene oxide than just a widely forecast decline in production. Two small producers will drop out, leaving only Dow Chemical and Oxirane.

As of midyear, both BASF Wyandotte and Olin will phase out production of propylene oxide—BASF Wyandotte at Wyandotte, Mich., and Olin at Brandenburg, Ky. Combined capacity to be eliminated is about 300 million lb a year, or a bit more than 10% of total U.S. capacity. Both plants are relatively old and used dated chlorohydrin technology, which is beset with pollution problems and inefficiencies when oporated on a small scale.

However, both companies indicate they will continue to make propylene oxide derivatives. They thus will increase outside purchase of the material and swell propylene oxide's merchant market. As a result, the two shutdowns will not appreciably affect demand for propylene oxide except in minor adjustments due to inventory changes.

The decline in propylene oxide production this year will come mainly from reduced demand for derivative polyols in polyurethane plastics. The decline is expected to be 15 to 20% of 1979 production of 2.3 billion lb, or to about 1.9 billion lb.

Although some industry sources forecast even lower 1980 production for propylene oxide, 1.9 billion lb still would sink the average plant operating rate to less than 65% of first-quarter nameplate capacity. The actual average rate would be closer to 69%, because of plant shutdowns coming up.

With little likelihood of major new capacity anytime soon, capacity use for propylene oxide can only go up after the recession. But the rate rise will be slow because growth forecasts over the next few years are in the 4 to 5% area. Oxirane will tack on 100 million lb to capacity at the end of 1980 through debottlenecking. After that, the new-capacity slate is blank.

The big problem for propylene oxide this year is the same as for many major-volume chemicals—steep declines in auto and home markets. These two consumer outlets account for much of polyurethane use and so govern the fortunes of propylene oxide.

Even before the slump in auto sales, polyurethane flexible foam used in seats was threatened as designers worked to reduce the auto weight to try to meet mileage standards. The combination of weight savings and lower auto volume could bring a 30% decline in the amount of propylene oxide going into auto seating this year.

Offsetting this decline is increased use per auto of reaction injection molding (RIM) of rigid polyurethane components. Other RIM polyurethane products also are being developed, resulting in large growth. On balance, RIM consumption of propylene oxide in 1980 may show a slight increase, the only category that forecasters figure this way.

Other flexible foam uses depend heavily on the housing market. Furniture, especially bedding, and carpets continue as big uses. New-housing declines hurt but are partially offset by refurbishing of existing houses as consumers attempt to live with what they have.

Propylene glycol, the second largest use of propylene oxide, goes mainly into unsaturated thermoset polyester resins and into additives for a host of materials. Throughout 1980, polyester resins have been reeling under the impact of the recession on their dominant outlet, glass-fiber-reinforced plastics. These plastics go heavily into consumer durables such as autos, boats, and appliances.

The reinforced plastics market began to soften much earlier in the economic downturn than did most of the rest of the chemical business. The reason is reinforced plastics' close tie to long suffering auto and boat markets. By early 1980, reinforced plastics producers knew they faced a falling year.

The decline in these applications could translate to a 20% decline in this area for propylene oxide. Propylene oxide use in food, drugs, and cosmetics, though small, probably will hold about even in 1980.

Overall, because of its recession-socked uses, propylene oxide probably will have a greater decline in production than will many other chemicals in 1980. Its production could fall off more than in the 1974–75 recession, a prospect of little comfort to producers who have just trudged through a long business expansion with overbuilt plants.

Weaknesses developing in European chemicals

Executives and chartists in the West European chemical industry are paying closer attention than usual to economic data. And the trends they see emerging don't please them.

Despite strong first-quarter sales and pretax earnings that most chemical companies in Western Europe achieved this year, there are definite signs of weaknesses developing. Demand has slackened and plant capacity utilization has slipped as a result.

The situation shows every sign of worsening. Business is slack in Europe during the summer even at the best of times. This will compound the effect of the current recession as it bites deeper.

Chemical production index statistics graphically illustrate the situation. In France, January saw the index almost reach 172 (1970 = 100), an all-time high for the country. But in February it fell back to about 169 and moved down further to below 162 in March. The official April figure wasn't out at press time, but it's expected to be bad.

The situation is similar in the U.K. The chemical production index plateaued at about 143 in January and February and then retreated below 134, the level last registered in March 1978. (The deep trough in January last year was due to a prolonged strike by U.K. road haulage drivers at the time.) The result was a decline of nearly 7% between January and April this year, compared to a rise of some 22% in the first four months last year.

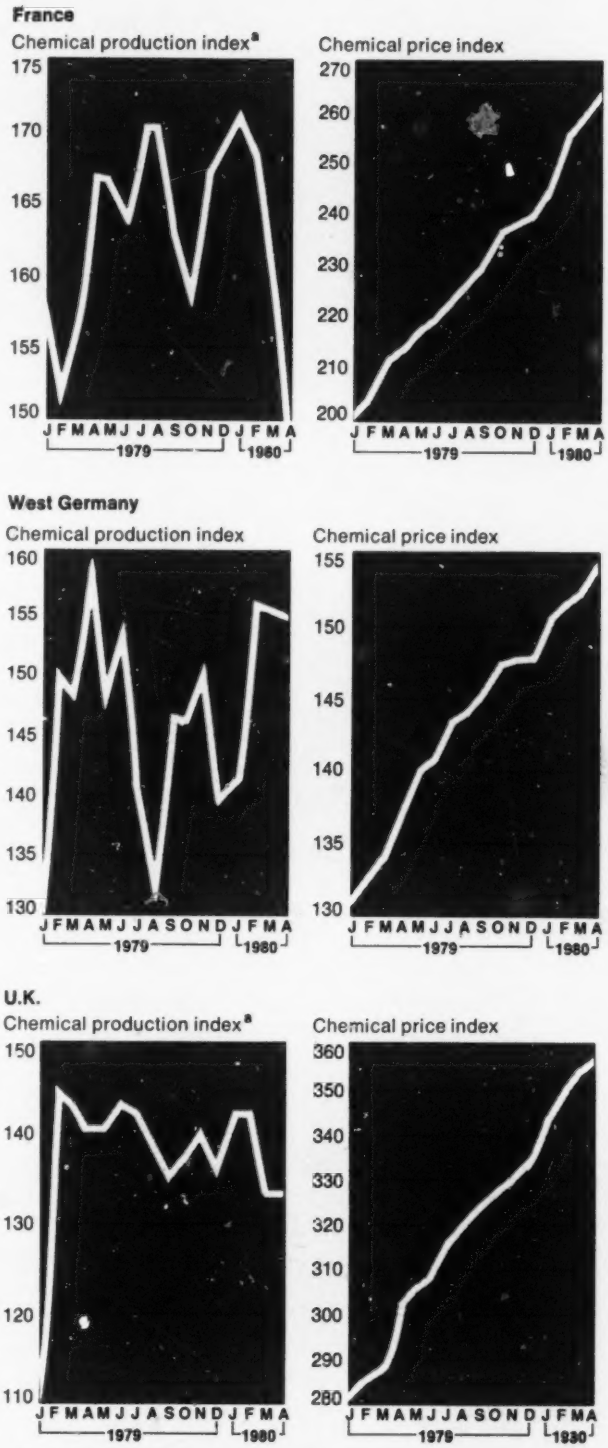
West Germany bucked the trend, but only barely. March and April were off from the February high. The first four months showed an overall production increase of about 9%. However, this was only half the value of the rise in the first four months of 1979.

Fortunately, the chemical price indexes in the three countries have continued upward, although chemical managers complain that what gains they have been able to achieve have not been sufficient to keep pace with rising operation and feedstock costs. Between January and April, chemical prices on average gained 7% in France, less than 3% in West Germany, and about 4% in the U.K.

Matthias Seefelder, chairman of West Germany's BASF, had this to say at his company's annual general meeting recently: "The fact that sales revenue for the month [of June] is higher [than in June 1979] can be ascribed solely to the higher level of prices. It conceals a recession in sales volume indicative of the recession in the market, particularly the [West] German domestic market. The trend in orders received is downward, and policies adopted by our customers signal uncertainty about future movements. It is practically impossible to forecast what the situation will be toward the end of the year."

The statement of Hoechst's chairman, Rolf Sammet, was cast in a similar vein. "Reduced [sales] and shrinking margins for agrochemicals, organic chemicals, plastics, and fibers are clear indicators of a trend reversal," he says. "We need, therefore, to be rather more circumspect with our forecasts for the remainder of the year without, however, becoming pessimistic."

Dermot O'Sullivan, London



a Seasonally adjusted. **Note:** Base year for all indexes is 1970 = 100.